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C-A OPERATIONS PROCEDURES MANUAL

ATTACHMENT

7.1.65.h Safety Issues Associated with the 4 O’Clock Yellow Valve Box

C-A OPM Procedures in which this Attachment is used.		
7.1.65		

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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 Collider-Accelerator Department Chairman Date

M. Sardzinski



SAFETY ISSUES ASSOCIATED WITH THE 4 O'CLOCK YELLOW VALVE BOX

Contributors: Bill Dejong, Len Masi, Anthony Nicoletti, Tom Tallerico, Andreas Warkentien, Mark Sardzinski, Dewey Lederle.

This document describes the safety issues associated with working on or inside the 4 o'clock yellow valve box. It is not meant to cover the details of every job. A job specific work permit reviewed by appropriate personnel is still required to complete any work inside the valve box.

MECHANICAL SAFETY ISSUES

Component Details

The 4 o'clock yellow valve box is part of the RHIC Cryogenic Distribution System. It is comprised of a vacuum tank that houses liquid pots, process piping, heat shield piping, temperature devices and liquid level probes. The following is detailed description of some of the major components, taken from *Cryogenic System, vii System Components manual.*

Inlet Recooler (liquid pots): The Inlet Recooler is a heat exchanger assembly located in a valve box. By means of this heat exchanger helium gas which is about to enter the, magnet string at one end (Dipole D0) of a sextant is cooled to a temperature close to the temperature of the boiling liquid helium bath provided on one side of the heat exchanger.¹ **Process Piping and valves:** The (present) conceptual design envisions that all the piping for a ring will be carried in a common jacket with a heat shield. Pipes will be provided to carry the helium for the following: Magnet coolant, with power leads, Supply header, Return header, Utility header and Heat Shield.

This connecting piping also contains all the isolation and diverting valves required to meet the RHIC operating scenarios. Groups of these valves have been gather into a single valve box located between each pair of sextants.²

¹ Vii System Components, RHIC Design Manual, pg29
² Vii System Components, RHIC Design Manual, pg 33
C-A-OPM-ATT 7.1.65.h (Y)

Confined Space

The 4 o'clock valve box is considered a confined space. Any work inside the box must adhere to the confined space regulations described in the BNL SBMS.

Trapped Helium Volumes

The potential exists for trapped pockets of high pressure helium inside the valve box. Prior to penetrating the box, contact the cryo- control room at x3837 to verify no trapped helium volumes exist.

Pressurized Helium Sources

4 o'clock Yellow Valve box is part of the RHIC cryogenic system and has the potential to see pressurized Helium gas and Nitrogen gas sources. Following are a list of potential sources and the valves associated with isolating them (Reference drawing(s) 3A995064, 3A995063, 3A995065, 3A995066, 3A995062 and 3A995108.

3A995064 4 o'clock Yellow Ring P&ID

H6528M		
H6529M		
H6530M		
H6531M		
H6532M		
H6533M		Lead Flow Return to Warm Return Line
H6534M		
H6535M		
H6536M		
H6537M		
H6538M		
H6480M		"M" Line Vacuum Manifold
H6475M		"M" Line Vacuum Manifold
H6476M		"S" Line Vacuum Manifold
H6481M		"S" Line Vacuum Manifold
H6477M		"H" Line Vacuum Manifold
H6482M		"H" Line Vacuum Manifold
H6478M		"U" Line Vacuum Manifold
H6483M		"U" Line Vacuum Manifold
H6484M		"R" Line Vacuum Manifold
H6479M		"R" Line Vacuum Manifold
H6412M		Block and Bleed
H6417M		Block and Bleed
H6409M		Block and Bleed
H6422M		Block and Bleed
H6424M		Block and Bleed

3A995063 SEXTANT 2/3 Sheets 1-8

H6545A	Flow Manifold @ 3Q3 Yellow
H6546A	Flow Manifold @ 3Q6 Yellow
H6547A	Flow Manifold @ 3Q9 Yellow
H6548A	Flow Manifold @ 3Q11 Yellow
H6549A	Flow Manifold @ 3Q14 Yellow
H6550A	Flow Manifold @ 3Q16 Yellow
H6551A	Flow Manifold @ 3Q19 Yellow
H6552A	Flow Manifold @ 3D20 Yellow
H6553A	Flow Manifold @ 2Q19 Yellow
H6554A	Flow Manifold @ 2Q16 Yellow
H6555A	Flow Manifold @ 2Q14 Yellow
H6556A	Flow Manifold @ 2Q11 Yellow
H6557A	Flow Manifold @ 2Q9 Yellow
H6558A	Flow Manifold @ 2Q6 Yellow
H6559A	Flow Manifold @ 2Q3 Yellow

3A995062 2o'clock Yellow Ring P&ID

H6280M	
H6281M	
H6282M	
H6283M	
H6284M	
H6285M	Lead Flow Return to Warm Return Line
H6286M	
H6287M	
H6288M	
H6289M	
H6253M	"M" Line Isolation
H6254M	"S" Line Isolation
H6202A	"H" Line Isolation
H6203A	"U" Line Isolation
H6204A	"R" Line Isolation
H6266M	"M" " Line Vacuum Manifold
H6267M	"S" Line Vacuum Manifold
H6268M	"H" Line Vacuum Manifold
H6269M	"U" Line Vacuum Manifold
H6270M	"R" Line Vacuum Manifold
H6212M	Block and Bleed
H6217M	Block and Bleed

3A995065 SEXTANT 4/5 Sheets 1-8

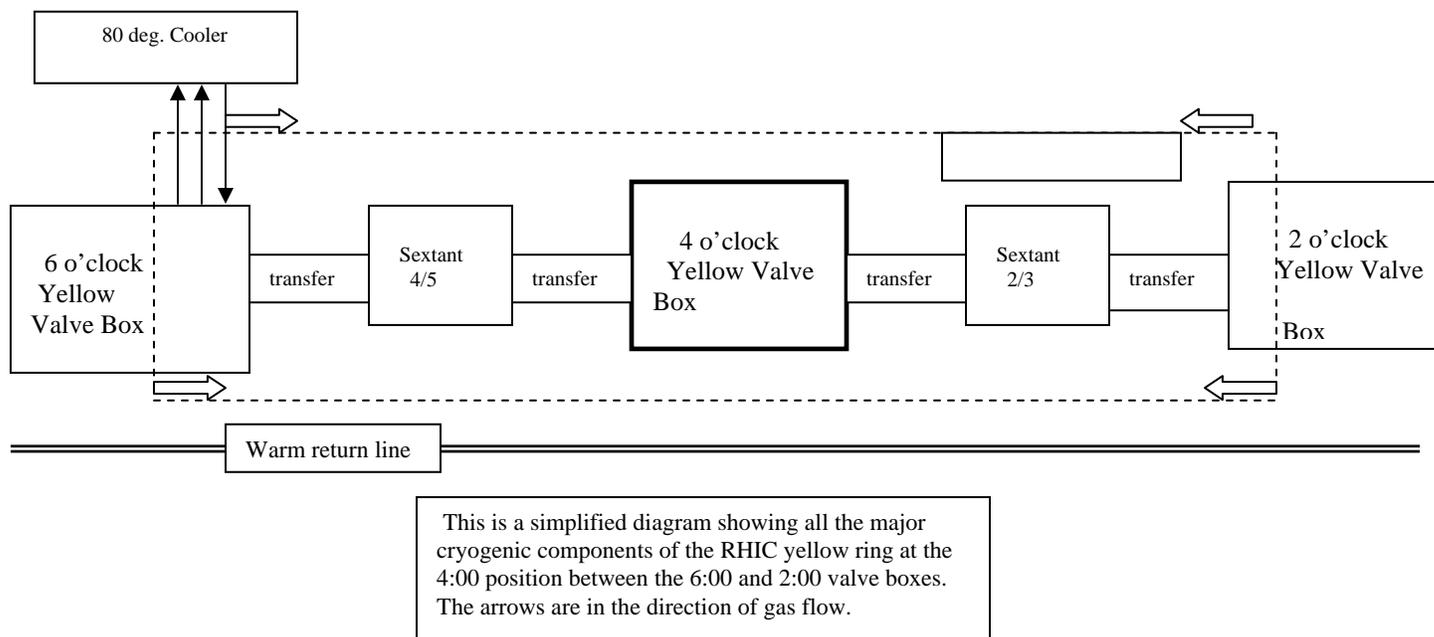
H5380A	Flow Manifold @ 5Q3 Yellow
H5381A	Flow Manifold @ 5Q6 Yellow
H5382A	Flow Manifold @ 5Q9 Yellow
H5383A	Flow Manifold @ 5Q11 Yellow
H5384A	Flow Manifold @ 5Q14 Yellow
H5385A	Flow Manifold @ 5Q16 Yellow
H5386A	Flow Manifold @ 5Q19 Yellow
H5387A	Flow Manifold @ 5D20 Yellow
H5388A	Flow Manifold @ 4Q19 Yellow
H5389A	Flow Manifold @ 4Q16Yellow
H5390A	Flow Manifold @ 4Q14 Yellow
H5391A	Flow Manifold @ 4Q11 Yellow
H5392A	Flow Manifold @ 4Q9 Yellow
H5393A	Flow Manifold @ 4Q6 Yellow
H5394	Flow Manifold @ 4Q3 Yellow

3A995066 6o'clock Yellow Ring P&ID

H6623M	"M" Line Isolation
H6601A	"S" Line Isolation
H6615A	"S" Line Isolation
H6602A	"H" Line Isolation
H6745A	"H" Line Isolation
H6603A	"U" Line Isolation
H6608A	"U" Line Isolation
H6637A	"U" Line Isolation
H6604A	"R" Line Isolation
H6636A	"R" Line Isolation
H6780M	"M" " Line Vacuum Manifold
H6781M	"S" Line Vacuum Manifold
H6782M	"H" Line Vacuum Manifold
H6783M	"U" Line Vacuum Manifold
H6784M	"R" Line Vacuum Manifold
H6622M	Block and Bleed
H6646M	Block and Bleed

3A995108 80Degree Cooler Integration

H9375A	Supply to Rings
H9369A	"M" Line Supply
H9365A	"H" Line Supply



1. Vacuum Systems

The only possible operations and environmental issues associated with the vacuum system are locking out the turbo vacuum pumps that are used to establish insulating vacuum. Details are in the electrical safety section. Before entering the valve box contact the C-AD vacuum group for assistance in isolating the vacuum system and introducing Air/Nitrogen into the valve box. The main isolation valve for the valve box is V6402A.

2. Pneumatic Systems

Valves located on the top of the valve box are supplied with compressed air at approximately 100 psig. Air to valves can be isolated via manifolds located at the valve box. Reference drawing 3A995100. Exercise extreme caution when working on top of the valve box, not to damage the plastic tubing that feeds the air to the valves.

3. Tube Trailers

Occasionally helium tube trailers are used to pressurize cryo process lines. These penetrations can be at various locations inside the valve box and may bypass locked out valves. Any person entering the valve box should inspect the area for a tube trailer connection and check with the cryo-control (x3837) room to make sure there are no trailer hazards.

If trailers are stationed at other locations in the Ring, the potential exists for Gas to reach the 4 o'clock yellow valve box via cryogenic process lines (Magnet, Heat shield, Utility, Supply and Return). Check with the cryogenic control room to determine if trailers are stationed at other locations in the ring and to insure local LOTO is in place in the area where the trailer connects to the cryo system The LOTO list should be covered in the job specific work permit.

Piping arrangement.

External

Extreme caution should be exercised when working on or around the valve box , a review of the work plan should be done prior to working on the valve box.

There are numerous hazardous conditions associated with the piping arrangement. For example low hanging piping can cause head injuries. Also work that is outside of the “railed” platform shall not be attempted by “climbing” over the rail.

Internal

A detailed plan should be in place before working inside the valve box , the following is a list of hazards inside the valve box.

- ❖ The valve box is shaped like a cylindrical tank with no floor built into it, this makes it difficult to move around.
- ❖ The piping arrangement is close together and is covered in MLI.
- ❖ Care should be taken not to damage small instrument tubing.
- ❖ Sharp edges from brackets are a hazard.
- ❖ If there is any welding and cutting involved in working inside the valve box a CONFINED SPACE PERMIT is required.

Figures 1-5 below are some of the external views of the 4 o'clock Yellow Valve Box.

Fig. 1 4 o'clock yellow valve box access cover with confine space warning sign



Fig. 2 A partial view of the process valves of 4 o'clock valve box. The sign in the background is for the magnet power leads which have a protective fence around them.



Fig. 3 A partial view of the process valves for 4 o'clock. When servicing the equipment on top of the valve box The curved surface is a hazard, extra caution should be consider.



Fig. 4 A partial view of some of the external piping, some piping can cause head injuries because of their location.

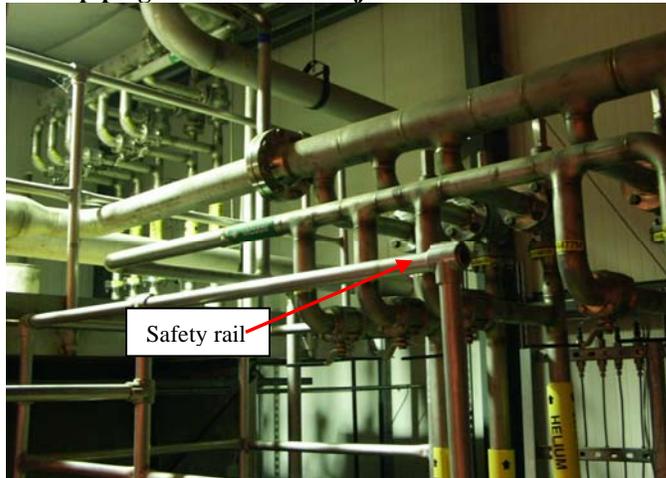


Fig. 4 Posted at the entrance of each valve box building is a caution sign stating the ODH hazard level. Contact information card



Electrical Safety Issues

1) In conjunction with the accident in Cold-box 3 (RHIC 25 Kw refrigerator) in which a technician burned his hand on a heater, we investigated the potential for a similar event in the yellow valve box in service building 4. Careful inspection of the valve box indicates no lethal voltage potentials and no installed heaters internal to the valve box. There are no feed-through(s) externally that contain high voltages that would pass into the cold-box. The only feed-through(s) (cables labeled 4YA, 4YB and 4YC) that exist are for low-level instrumentation (temperature sensors).

Fig. 5 Cables for low-level instrumentation.

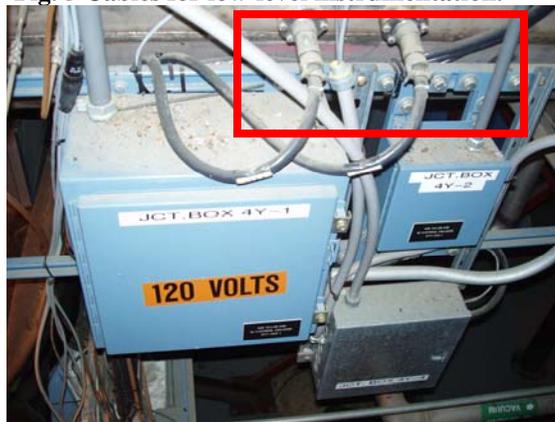


Fig.6a 6b. Other low instrumentation cables located on the side and top of the valve box.



2) Gauges and controllers for insulating vacuum are located at various locations on the valve box. They are all external of the valve box and do not enter the valve box with any high voltage.

Fig. 7 Vacuum gauge and cable.



3) Each valve box has an associated slide valve as shown in the photo below. There is 120 Volts ac present at this slide valve.

Fig. 8 Turbo-pump and vacuum valve.



Supporting Documents:

3A995064 4o'clock Yellow Ring P&ID

3A995063 SEXTANT (yellow) 2/3 Sheets 1-8

3A995062 2o'clock Yellow Ring P&ID

3A995065 SEXTANT (yellow) 4/5 Sheets 1-8

3A995086 6o'clock Blue Ring P&ID

3A995108 80Degree Cooler Integration